observations of four stars of the Orion type (9 Camelopardi, κ Cancri, μ Sagittarii, and δ^1 Lyræ) which have variable radial velocities (*Astrophysical Journal*, No. 5, vol. xix.).

MASS AND SHAPE OF JUPITER.—At the June meeting of the Royal Astronomical Society, Mr. Bryan Cookson read a paper giving the results of a series of heliometer observations of Jupiter's satellites made by him at the Cape Observatory during 1901–2.

Within two months of the opposition of the planet he made 783 observations of the satellites in distance and position angle. The values obtained for the mass were

$$1 : 1047{\cdot}69 \pm 0{\cdot}09 \text{ and } 1 : 1047{\cdot}66 \pm 0{\cdot}06$$

during 1901 and 1902 respectively. These agree very well *inter se*, but differ considerably from Prof. Newcomb's adopted value of 1 : 1047·35, a difference which has yet to be explained or eliminated.

The value for the compression-constant of the planet was also different from the adopted value, being 11 per cent. greater. As determined in the paper, the ellipticity is 1 : 15·8, but direct measurements of the equatorial and polar diameters gave 1 : 16·5. Part of this difference may be real, but part may be due to the difficulty experienced in measuring the planet's diameter (*Observatory*, No. 346).

"REVERSALS" IN SUN-SPOT SPECTRA.—In a paper appearing in No. 5, vol. xix., of the *Astrophysical Journal*, Mr. W. M. Mitchell, of the Princeton (N.J.) Observatory, publishes the results of four sets of observations, made during March and April with a Rowland grating spectroscope (20,000 lines) attached to the 23-inch refractor of the Halsted Observatory, of the lines reversed in sun-spot spectra in the region λ 6770 to λ 4915. The number of lines more or less affected in this region was more than 270, and Mr. Mitchell gives a table containing about 70 lines which were found reversed, and 6 lines which were thinned. In the region C–D about 35 per cent. of the lines affected were seen reversed, whilst for a further 5 per cent. the appearance of reversal was too uncertain to give definite results. The C line was observed partially reversed on April 8, but the *b*, E, and D groups were never affected. D_3 was not seen at all.

ESCAPE OF GASES FROM THE EARTH'S ATMOSPHERE.—In a communication to the *Philosophical Magazine* (June, 1904) Dr. Johnstone Stoney directs attention to a recent letter from Mr. S. R. Cook, published in NATURE (March 24), on the "Escape of Gases from Atmospheres." After stating that he arrived at the same conclusion as Mr. Cook, by the same methods, thirty or forty years ago, and has since had to abandon that conclusion, Dr. Stoney shows that the flow of helium from springs into the earth's atmosphere is from 3000 to 6000 times more than can be accounted for by the minute quantity dissolved by the rain in falling, yet the relative quantity of helium in the atmosphere apparently remains constant. Therefore, he says, helium *is* escaping from the atmosphere, the rate of escape being equal to that of the influx. Further, Dr. Stoney also shows that theoretically the conditions under which the flights of gaseous molecules take place in the upper atmosphere sufficiently explain the outflow, as it would only be necessary for the chance of escape for each molecule to occur once in several days in order to account for the amount received by the atmosphere from the earth.

FORTHCOMING RETURN OF ENCKE'S COMET.—In No. 6, vol. i., of *Knowledge and Illustrated Scientific News*, Mr. Denning publishes a few notes in reference to the return of Encke's comet during the coming autumn. Due at perihelion on January 4, it should be observable in large telescopes about August or September, and will be nearest the earth, at a distance of about 35,000,000 miles, in the third week in November. On October 4 it will apparently be about half-way between β Andromedæ and α Trianguli, thence, travelling westward, it will arrive at about 5° N.E. of β Pegasi on November 1.

The present period, according to Prof. Seagrave, is about 1206d. 20·25h., and during the coming apparition the favourable conditions of 1805, 1838, and 1871 (period 33 years) should be repeated. It is possible that early in December, when close to Altair, the comet may be visible to the naked eye.

THE UPPER CHALK OF ENGLAND AND ITS ZONES.

WE have received two important contributions to our knowledge of the Upper Chalk in this country. The one on "The Upper Chalk of England" is the third and concluding volume of Mr. Jukes-Browne's memoir on the Cretaceous rocks of Britain, issued by the Geological Survey (price 10s.). It is a goodly volume of 566 pages, in which the stratigraphical features of the Upper Chalk and the fossils of the successive zones are very fully dealt with. As in previous volumes, Mr. William Hill has contributed particulars of the microscopic structure of the Chalk. The ample topographical and palæontological descriptions of the Chalk will enable the student readily to ascertain what is known, and the author has been fortunate in being able to embody the results of a great part of the recent work accomplished by Dr. Rowe. In one chapter he discusses the bathymetrical conditions during the formation of the Upper Chalk, pointing to facts presented by the Chalk rock-beds which indicate a general upheaval of the British area. Later on, during the period of the Micraster and Marsupite zones, evidence of subsidence is afforded, and this was probably succeeded by re-elevation during the time of the Belemnitella zone. This volume contains a general account of the economic products of the Chalk, including water-supply, and reference is made to the bournes or nail-bournes, notable examples of which, as at Croydon and elsewhere, have recently manifested themselves. The Chalk escarpments and other features of Chalk districts are described. There is also a general list of all the known fossils from the Chalk of England, with references to zones and localities, and there is a full bibliography. Mr. Jukes-Browne is to be congratulated on the completion of this exhaustive work. We only wish that it had been somewhat better illustrated.

Turning to the other work, "The Zones of the White Chalk of the English Coast, part iv., Yorkshire," by Dr. Arthur W. Rowe, we find a work of a little more than a hundred pages, with twenty-two beautiful photographic plates and other illustrations, issued by the Geologists' Association (vol. xviii., part iv., price 3s.).

The previous portions of Dr. Rowe's work on the zones in Kent and Sussex, in Dorset and in Devon, have been already noticed in NATURE. The present part is the result of "42 days of steady work" on the cliff-sections and adjacent chalk-pits of the coast near Flamborough Head. The time seems limited (as the author observes), but as he went fortified with the accumulated knowledge and experience of many years' assiduous study, and was accompanied, as before, by Mr. C. D. Sherborn, he was ready and able to make the fullest use of his time. When he refers to the region as "a veritable *terra incognita*" we can hardly agree with him, despite his own saving clauses. But that he has enriched our knowledge to a very large extent, as he invariably does, was inevitable, and all geologists will rejoice.

The essay itself fills the reader with enthusiasm, for it is written with vigour and with a heartiness that is contagious. The work proved less easy, though not less interesting, than was anticipated. The record of the fauna was found to constitute "a veritable zoological romance."

It was "wholly impossible to institute any valid comparison between this marvellous coast and any of the sections which we had previously described." The variations in the distribution and range of the species, the rarity of zonal guide-fossils, the hardness of the rocks, to say nothing of the difficulties of getting at the strata, were alike remarkable. At the same time the results of Dr. Rowe's work afford "overwhelming proof of the validity and homogeneity of the zonal theory," and we cordially commend the work to all students. In an appendix Mr. G. W. Lamplugh contributes some notes on the conditions of accumulation of the Yorkshire Chalk, and refers to the finding of an ammonite, 3 feet in diameter, beneath which was an agglomeration of small fossils, evidently protected from decay by the huge ammonite. He remarks that a considerable portion of the Chalk was probably due to the pulping-down of calcareous bodies by lowly organic agencies. Referring back to Mr. Jukes-Browne's volume

(p. 343), we learn also from Mr. W. Hill that "As a whole the amorphous material of the Upper Chalk appears to be made up almost entirely of the débris of calcareous organisms."

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

DR. HAROLD A. WILSON has been elected senior lecturer in physics at King's College, London, and Mr. S. C. Laws junior lecturer.

ON July 27 Sir Thomas H. Elliott, K.C.B., Secretary to the Board of Agriculture, will open the extensions of the Midland Agricultural and Dairy Institute at Kingston-on-Soar.

PROF. CHANTEMESSE has, at his own request, been transferred to the chair of hygiene at the University of Paris, vacant through the death of Prof. Proust. The chair of experimental pathology thus vacated has been filled by the appointment of Dr. Roger to succeed Prof. Chantemesse.

WE learn from *Science* that Mrs. Henry Whitman, of Boston, has made public bequests amounting to more than 40,000*l*., including 22,000*l*. to Radcliffe College and 2000*l*. to Harvard University; and that Mr. George Ehret, of New York, has given 2000*l*. to the permanent fund of Hamilton College.

MR. H. A. CLARK, late assistant lecturer in engineering at the University of Leeds, has been appointed head of the engineering department of the Northern Polytechnic Institute, London. Mr. Clark was Ramsbottom scholar at Owens College, Manchester, a Whitworth scholar, and is an associate of the Royal College of Science.

THE first annual report of the University Extension Guild has now been published. The object of the association, which was founded last December, is "to promote among all classes, at times convenient to all, the extension of university teaching." The report states that the work accomplished and the influence exerted by the guild have been considerable, and give great hopes of success in the future. The honorary secretary of the guild is Mr. Max Judge, 7 Pall Mall, S.W.

THE Montgomery County Council recently discussed a resolution, passed at the Swansea conference of county council delegates, recommending to county councils the establishment of schools of forestry, and the giving of grants to existing colleges. The chairman said all are agreed that planting is a very desirable agricultural improvement, and that the management of woods in many cases leaves much to be desired. It would be, he continued, for the advantage of the country if the council provided forestry instruction in addition to the instruction they had provided in other branches of rural pursuits, and at his suggestion delegates were appointed by the council to attend a conference to be held for the purpose of discussing the question.

THE Prince of Wales, who was accompanied by the Princess of Wales, on July 16 laid the foundation-stone of the new buildings of the Working Men's College, which was founded by F. D. Maurice. The plans of the new buildings show a hall to accommodate 250 persons, common rooms, club rooms, and gymnasium for the students, a library fitted for 10,000 books, and a museum. There are added electrical and chemical laboratories, with which the old college was not equipped. Altogether there is teaching space provided for 700 students. Replying to an address—read by the principal of the college, Prof. A. V. Dicey—the Prince of Wales expressed his cordial sympathy with the aims and objects of the college, which are to bring within reach of the working classes the means of knowledge and culture. As the Prince of Wales said later, "the Working Men's College has seen its aims fulfilled and its pioneer work taken up and extended by those numerous and great institutions for commercial and technical instruction which have been established in the capital and in all parts of the Empire."

THE importance of establishing a national school of forestry was recently urged by the Association of Chambers of Commerce. The following reply has been sent to the association by Sir Thomas Elliott, on behalf of the Board of Agriculture:—"The President of the Board of Agriculture and Fisheries fully recognises the importance which attaches to the question of afforestation and to the provision of a national system of instruction in forestry. Steps have already been taken in more than one direction to give effect to the recommendations of the departmental committee which was appointed in 1902, under the chairmanship of Mr. R. C. Munro Ferguson, M.P., to inquire into the subject. Through the agency of the Commissioners of Woods and Forests a school of forestry has been established in the Forest of Dean, and a movement is on foot for securing a suitable area of land in Scotland for the purpose of demonstrating scientific forestry. The Board has taken steps to secure the establishment of at least two lectureships in forestry in England, and some of the leading universities and agricultural colleges have been giving attention to proposals under this head. The agricultural departments of the University College of North Wales, Bangor, and of the Durham College of Science, Newcastle-upon-Tyne, appeared to offer special advantages as centres of instruction in forestry, and grants in aid of the establishment of schemes of education in the subject will be made by the Board to those institutions. The Board hopes that the arrangements thus made will result in a considerable improvement of the facilities available in this country for the acquirement of a knowledge of practical forestry."

THE following are among the awards of Carnegie research fellowships, scholarships, and grants for the academic year 1904–5, under the Carnegie trust, for the universities of Scotland:—FELLOWSHIPS.—*Physical*, D. B. McQuistan; *Chemical*, C. E. Fawsitt, Dr. J. C. Irvine, W. Maitland; *Biological*, J. Cameron, Dr. F. H. A. Marshall, H. J. Watt; *Pathological*, C. H. Browning, J. C. G. Ledingham, S. A. K. Wilson. SCHOLARSHIPS.—*Physical*, P. D. Innes, H. W. Malcolm, J. H. Maclagan Wedderburn, J. R. Milne; *Chemical*, Adam Cameron, W. A. K. Christie, F. W. Gray, J. Johnston, F. J. Wilson, J. Wood; *Biological*, Margaret T. Hamilton, W. D. Henderson; *Agricultural*, S. F. Ashby, C. Carter; *Physiological*, J. S. Rose; *Pathological*, C. M. Campbell, R. D. Keith, W. G. Rodger. GRANTS.—*Physical*, G. A. Carse, Prof. MacGregor, T. Oliver, W. Peddie; *Chemical*, Prof. G. G. Henderson and Dr. Gray, Dr. A. N. Meldrum; *Biological*, Dr. J. H. Ashworth, Dr. J. Beard, Cyril Crossland, Prof. J. Cossar Ewart, Prof. Paterson, Dr. John Rennie, W. G. Smith, Dr. D. Waterston, Dr. J. H. Wilson, Prof. R. Patrick Wright and A. N. M'Alpine; *Anatomical*, E. B. Jamieson; *Pharmacological*, Prof. R. Stockman; *Pathological*, Dr. J. K. Love, E. Bramwell, Prof. Carstairs C. Douglas, A. H. Edwards, Dr. A. Goodall, J. M. Kirkness, Prof. Robert Muir, Peter Paterson, W. B. Inglis Pollock, B. P. Watson, Dr. J. M. Bowie, Dr. James Scott, D. C. Watson. The twenty-four scholarships, twelve fellowships, and thirty-five grants awarded for 1904–5 amount in all to 5300*l*. The amount expended by the trust under this scheme for 1903–4 was 3400*l*.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 19.—"On the Liquefied Hydrides of Phosphorus, Sulphur, and the Halogens as Conducting Solvents." Parts i. and ii. By D. **M'Intosh**, B. D. **Steele**, and E. H. **Archibald**. Communicated by Sir William Ramsay, K.C.B.

In this paper the behaviour of phosphuretted hydrogen, sulphuretted hydrogen, hydrogen chloride, bromide, and iodide as conducting solvents has been investigated, and, in order to try and explain certain abnormalities in the variation of conductivity with concentration of their solutions, the following physical constants have been determined. (1) The vapour pressure curves from which the melting and boiling points are obtained. (2) The densities at various temperatures. (3) The molecular surface energies; from these it is seen that the hydrides of phosphorus and chlorine when liquefied are more or less associated to form complex molecules, whereas the remaining compounds occur as simple molecules. (4) The viscosity temperature coefficient. This was measured in order to compare with